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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
GOFF II, JOHN L	

ART UNIT	PAPER NUMBER
1733	

DATE MAILED: 11/08/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/663,207	CHAN, ALBERT	
	Examiner	Art Unit	
	John L. Goff	1733	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *03 October 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-32* is/are pending in the application.

4a) Of the above claim(s) *32* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-31* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *15 September 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *2/2/04*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

1. Applicant's election without traverse of Group I, claims 1-31, in the reply filed on 10/3/05 is acknowledged.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1, 3, 4, 6, 7, 9-13, 16, 17, 19-23, 28, 29, and 31 are rejected under 35 U.S.C. 102(b) as being anticipated by Nguyen (U.S. Patent Application Publication 2001/0038093).

Nguyen discloses a method of attaching an electronic component (e.g. integrated circuit (IC) chip) to a heat-dissipating surface (e.g. heat sink) through a dispensable liquid curable adhesive paste having a relatively low viscosity. Nguyen teaches the adhesive comprises a liquid curable polymer (e.g. silicon-based), fusible filler such as solder powder (e.g. Sn/Bi, Sn/Ag/Cu, etc. having a melting point less than 235 °C and a thermal conductivity greater than 20 W/mK), fluxing agent, and non-fusible filler (e.g. copper or silver metallic particles having a high melting point, particle size of 0.02 to 0.1 mm, and thermal conductivities of 400 W/mK or more). Nguyen teaches that after application the adhesive is heated to above the temperature of the

solder powder to melt the solder powder and cure the adhesive (Paragraphs 6-8, 14, 15, 22, 26, and 30-32).

Regarding the reflow of the solder material to form interconnecting metal structures dispersed in the polymer matrix, it is noted that Nguyen specifically teaches that during application the solder powder melts such that reflow is inherent.

Regarding claim 10, Nguyen does not require forming the adhesive under any elevated heating conditions and the adhesive is liquid dispensable such that it is inherent the adhesive is formed at less than 80 °C.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 1, 3, 4, 6, 9-14, 16, 17, 19-23, 28, 29, and 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jayaraman et al. (U.S. Patent 6,926,955) in view of any one of Kirsten (WO 97/07542), the background of McCormack et al. (U.S. Patent Application Publication 2001/0030062), or Pennisi et al. (U.S. Patent 5,128,746).

Jayaraman et al. disclose a method of attaching an electronic component (e.g. integrated circuit (IC) chip) to a heat-dissipating surface (e.g. heat sink including those that are actively cooled) through a dispensable liquid curable adhesive paste having a relatively low viscosity. Jayaraman et al. teach the adhesive comprises a liquid curable polymer (e.g. epoxy or silicon-

based), fusible filler such as solder powder (e.g. Sn/Bi, Sn/Pb, Sn/Ag, Sn/Ag/Cu, etc. having a melting point less than 235 °C and a thermal conductivity greater than 20 W/mK), and non-fusible filler (e.g. silver metallic particles having a high melting point and a thermal conductivity of 400 W/mK or more). Jayaraman et al. teach that after application the adhesive is heated to above the temperature of the solder powder to melt the solder powder and reflow the solder to form interconnecting metal structures and cure the adhesive (Figures 3 and 4 and Column 3, lines 34-38 and 49-66 and Column 4, lines 9-19 and 49-56 and Column 5, lines 33-56 and Column 6, lines 22-47 and 57-61). Jayaraman et al. do not specifically teach including a fluxing agent in the adhesive. It would have been obvious to one of ordinary skill in the art at the time the invention was made to include within the adhesive taught by Jayaraman et al. a fluxing agent to remove surface oxides from the solder powder and allow the solder powder to better wet out as was well known in the art and shown for example by any one of Kirsten, the background of McCormack et al., or Pennisi et al.

Kirsten discloses a method for bonding electronic components using a dispensable liquid curable adhesive paste including a solder reflow process to form interconnecting metal structures followed by curing the adhesive. Kirsten teaches the adhesive comprises a liquid curable polymer (e.g. epoxy), fusible filler such as solder powder (e.g. Sn/PB, etc. having a melting point less than 235 °C and a thermal conductivity greater than 20 W/mK), and fluxing agent. Kirsten teaches the fluxing agent is added to remove surface oxides from the solder powder and allow the solder powder to better wet during reflow and curing of the adhesive (Page 3, lines 6-8 and Page 13, lines 4-38 and Page 17, lines 11-37). The background of McCormack et al. discloses a dispensable liquid curable adhesive paste used in bonding electronic components comprising a

curable polymer, fusible filler such as solder powder (e.g. Sn/PB, etc. having a melting point less than 235 °C and a thermal conductivity greater than 20 W/mK), and fluxing agent. The background of McCormack et al. teach the fluxing agent is added to remove surface oxides from the solder powder (Paragraph 2). Pennisi et al. disclose a method for bonding electronic components including solder interconnects through a dispensable liquid curable adhesive paste wherein the adhesive includes fluxing agent to remove surface oxides from the solder powder and allow the solder powder to better wet during reflow and curing of the adhesive (Column 2, lines 61-64 and Column 3, lines 9-19 and 57-65).

Regarding claim 10, Jayaraman et al. do not require forming the adhesive under any elevated heating conditions and the adhesive is liquid dispensable after forming such that it appears the adhesive is formed at room temperature and the limitation is met. In any event, it would have been obvious to one of ordinary skill in the art at the time the invention was made to experimentally determine the optimum forming temperature for the adhesive taught by Jayaraman et al. as modified by any one of Kirsten, the background of McCormack et al., or Pennisi et al. as doing so would have required nothing more than ordinary skill and routine experimentation.

6. Claims 1, 3, 4, 6, 9-14, 16, 17, 19-23, 28, 29, and 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nguyen in view of Jayaraman et al.

Nguyen is described above in full detail. As noted above is appears reflow of the solder material to form interconnecting metal structures is intrinsic to Nguyen. In any event, it would have been obvious to one of ordinary skill in the art at the time the invention was made that during the melting of the solder powder and curing of the adhesive taught by Nguyen the solder

powder would reflow to form interconnecting metal structures in the adhesive as was well known and shown for example by Jayaraman et al.

Jayaraman et al. is described above in full detail.

Regarding claim 10, Nguyen does not require forming the adhesive under any elevated heating conditions and the adhesive is liquid dispensable after forming such that it inherent the adhesive is formed at less than 80 °C. In any event, it would have been obvious to one of ordinary skill in the art at the time the invention was made to experimentally determine the forming temperature for the adhesive taught by Nguyen as modified by Jayaraman et al. as doing so would have required nothing more than ordinary skill and routine experimentation.

Regarding claim 14, Nguyen does not specifically teach an actively cooled heat-dissipating surface. It would have been obvious to one of ordinary skill in the art at the time the invention was made to use in the method taught by Nguyen heat-dissipating surfaces that are actively cooled as was well known in the art as shown for example by Jayaraman et al. wherein only the expected results would be achieved.

7. Claims 2 and 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nguyen optionally in view of JP2001284401.

Nguyen is described above in full detail. Nguyen is silent as to the percent by volume of solder powder in the adhesive, it being noted Nguyen is not limited to any particular percent by volume. It would have been obvious to one of ordinary skill in the art at the time the invention was made to experimentally determine the percent by volume of filler including solder powder in the adhesive as a function of the ability to form adequate interconnecting metal structures, adhesive strength of the bond, etc. as doing so would have required nothing more than ordinary

skill and routine experimentation, it being optionally noted a percent by volume of solder powder in the claimed range was well known in the art shown for example by JP2001284401.

JP2001284401 discloses a curable adhesive paste comprising 30-50% by volume resin, 30-50% by volume solder powder, and 15-30% by volume flux (See abstract).

8. Claims 2 and 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jayaraman et al. and any one of Kirsten, the background of McCormack et al., or Pennisi et al. as applied to claims 1, 3, 4, 6, 9-14, 16, 17, 19-23, 28, 29, and 31 above, and further in view of JP2001284401.

Claims 2 and 5 are rejected in the same manner as that applied above in paragraph 7 with it being further noted Jayaraman et al. teach the weight percent of filler is in the range of 10-95% such that a percent by volume within the claimed range would have been further obvious.

9. Claims 2 and 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nguyen and Jayaraman et al. as applied to claims 1, 3, 4, 6, 9-14, 16, 17, 19-23, 28, 29, and 31 above, and further in view of JP2001284401.

Claims 2 and 5 are rejected in the same manner as that applied above in paragraph 7.

10. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nguyen in view of Koning et al. (U.S. Patent Application Publication 2003/0150604).

Nguyen is described above in full detail. Nguyen is silent as to a teaching of incorporating metallic particles coated with solder in the adhesive, it being noted Nguyen teaches an adhesive comprising both metallic particles and solder. It would have been obvious to one of ordinary skill in the art at the time the invention was made to include in the adhesive taught by

Nguyen metallic particles coated with solder as was well known in the art as shown for example by Koning et al. to improve the conductive properties of the adhesive.

Koning et al. disclose a method of attaching an electronic component (e.g. integrated circuit (IC) chip) to a heat-dissipating surface (e.g. heat sink including those that are actively cooled) through a dispensable liquid curable adhesive paste having a relatively low viscosity. Koning et al. teach the adhesive comprises a liquid curable polymer (e.g. silicon-based) and non-fusible filler (e.g. copper or silver metallic particles having a high melting point, a particle size of 0.025 mm, and a thermal conductivity of 400 W/mK or more) coated with fusible filler such as solder (e.g. Sn/Bi, Sn/Ag, Sn/Ag/Cu, etc. having a melting point less than 235 °C and a thermal conductivity greater than 20 W/mK) wherein coating the non-fusible filler with the fusible filler serves to improve the conductive properties of the adhesive. Koning et al. teach that after application the adhesive is heated to above the temperature of the solder powder to melt the solder powder and reflow the solder to form interconnecting metal structures and cure the adhesive (Figures 3 and 4 and Paragraphs 11, 22, 27, 28, 30, 38, and 39).

11. Claims 7 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jayaraman et al. and any one of Kirsten, the background of McCormack et al., or Pennisi et al. as applied to claims 1, 3, 4, 6, 9-14, 16, 17, 19-23, 28, 29, and 31 above, and further in view of Koning et al.

Claim 8 is rejected in the same manner as that applied above in paragraph 10.

Regarding claim 7, Jayaraman et al. and any one of Kirsten, the background of McCormack et al., or Pennisi et al. as applied above teach all of the limitations in claim 7 except for a specific teaching of the mean particle size of the metallic particles. It would have been obvious to one of ordinary skill in the art at the time the invention was made to use in Jayaraman

et al. as modified by any one of Kirsten, the background of McCormack et al., or Pennisi et al. any well known mean particle size such as 0.025 mm as shown for example by Koning et al. as only the expected results would be achieved.

Koning et al. is described above in full detail.

12. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nguyen and Jayaraman et al. as applied to claims 1, 3, 4, 6, 9-14, 16, 17, 19-23, 28, 29, and 31 above, and further in view of Koning et al.

Claim 8 is rejected in the same manner as that applied above in paragraph 10.

13. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nguyen in view of Dietz (U.S. Patent 6,265,471).

Nguyen is described above in full detail. Nguyen is silent as to the thermal conductivity of the adhesive, it being noted as the adhesive is consistent and in agreement with that described and claimed by applicant it appears the claimed thermal conductivity in intrinsic to the adhesive taught by Nguyen. In any event, as the adhesive taught by Nguyen is to have optimum thermal conductivity properties it would have been obvious to one of ordinary skill in the art at the time the invention was made to form the thermally conductive adhesive taught by Nguyen to a well known high thermal conductivity such as 45 W/mK or more as shown for example by Dietz as only the expected results would be achieved.

Dietz disclose a highly thermally conductive dispensable liquid curable adhesive paste having a relatively low viscosity that comprises a liquid curable polymer and conductive solder filler having a thermal conductivity of 45 to 65 W/mK (Column 2, lines 28-35 and Column 7, lines 4-8).

14. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Jayaraman et al. and any one of Kirsten the background of McCormack et al., or Pennisi et al. as applied to claims 1, 3, 4, 6, 9-14, 16, 17, 19-23, 28, 29, and 31 above, and further in view of Dietz.

Claim 15 is rejected in the same manner as that applied above in paragraph 13.

15. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nguyen and Jayaraman et al. as applied to claims 1, 3, 4, 6, 9-14, 16, 17, 19-23, 28, 29, and 31 above, and further in view of Dietz.

Claim 15 is rejected in the same manner as that applied above in paragraph 13.

16. Claims 18 and 24-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nguyen in view of Bish et al. (U.S. Patent 6,906,413).

Nguyen is described above in full detail. Nguyen is silent as to the thickness of the applied adhesive, it being noted Nguyen is not limited to any particular thickness. It would have been obvious to one of ordinary skill in the art at the time the invention was made to apply the adhesive taught by Nguyen to any well known and conventional thickness such as up to 0.2 mm as shown for example by Bish et al. as only the expected results would be achieved.

Bish et al. disclose a method of attaching an electronic component (e.g. integrated circuit (IC) chip) to a heat-dissipating surface (e.g. heat sink) through a curable adhesive paste wherein the adhesive is applied to the component or surface in a typical thickness of up to 0.2 mm (Column 3, lines 33-56).

17. Claims 18 and 24-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jayaraman et al. and any one of Kirsten, the background of McCormack et al., or Pennisi et al. as applied to claims 1, 3, 4, 6, 9-14, 16, 17, 19-23, 28, 29, and 31 above, and further in view of Bish et al.

Claims 18 and 24-26 are rejected in the same manner as that applied above in paragraph 16.

18. Claims 18 and 24-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nguyen and Jayaraman et al. as applied to claims 1, 3, 4, 6, 9-14, 16, 17, 19-23, 28, 29, and 31 above, and further in view of Bish et al.

Claims 18 and 24-26 are rejected in the same manner as that applied above in paragraph 16.

19. Claim 27 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nguyen and Bish et al. as applied to claims 18 and 24-26 above, and further in view of Koning et al.

Claim 27 is rejected in the same manner as that applied above in paragraph 10.

20. Claim 27 is rejected under 35 U.S.C. 103(a) as being unpatentable over Jayaraman et al., any one of Kirsten, the background of McCormack et al., or Pennisi et al., and Bish et al. as applied to claims 18 and 24-26 above, and further in view of Koning et al.

Claim 27 is rejected in the same manner as that applied above in paragraph 10.

21. Claim 27 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nguyen and Jayaraman et al. as applied to claims 18 and 24-26 above, and further in view of Koning et al.

Claim 27 is rejected in the same manner as that applied above in paragraph 10.

22. Claim 30 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nguyen and Bish et al. as applied to claims 18 and 24-26 above, and optionally further in view of JP2001284401.

Claim 30 is rejected in the same manner as that applied above in paragraph 7.

23. Claim 30 is rejected under 35 U.S.C. 103(a) as being unpatentable over Jayaraman et al., any one of Kirsten, the background of McCormack et al., or Pennisi et al., and Bish et al. as applied to claims 18 and 24-26 above, and optionally further in view of JP2001284401.

Claim 30 is rejected in the same manner as that applied above in paragraph 7.

24. Claim 30 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nguyen and Jayaraman et al. as applied to claims 18 and 24-26 above, and optionally further in view of JP2001284401.

Claim 30 is rejected in the same manner as that applied above in paragraph 7.

Conclusion

25. Any inquiry concerning this communication or earlier communications from the examiner should be directed to **John L. Goff** whose telephone number is **(571) 272-1216**. The examiner can normally be reached on M-F (7:15 AM - 3:45 PM).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Dunn can be reached on (571) 272-1171. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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